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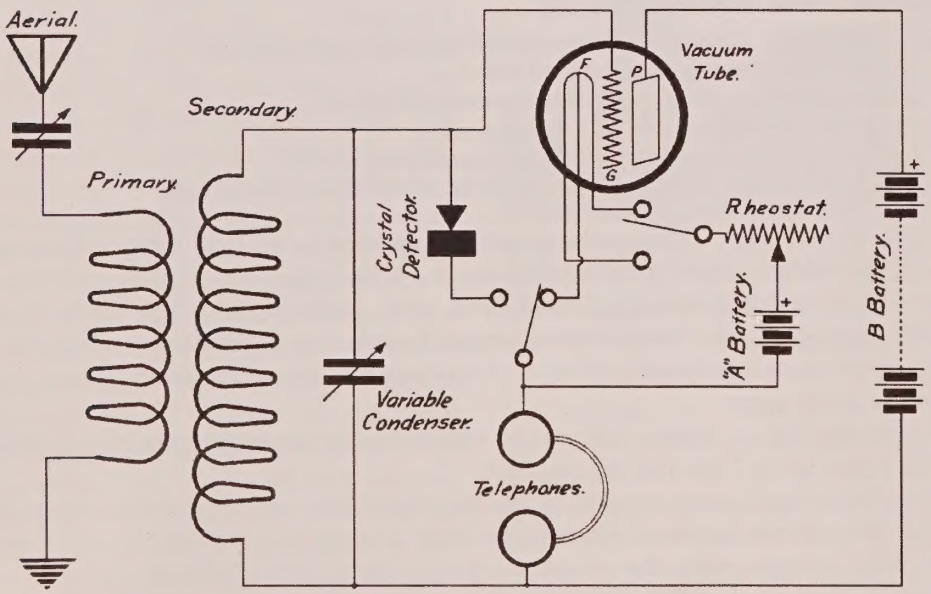
THE RJ4 DETECTOR AND THE WALLACE MYSTERY



WALLACE VALVE RECEIVER

TCA Special Publication No. 15

October, 2008

Produced by: Tube Collectors Association, Inc.
PO Box 636
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USA

The Tube Collectors Association is a nonprofit, noncommercial group of individuals active in the history, preservation, and use of electron-tube technology.

Officers and Staff

President: Jim Cross, (407) 816-8495, *jim@vacuumtubesinc.com*
Vice President: Al Klase, N3FRQ, (201) 435-5447, *al@ar88.net*
Secretary-Treasurer: Bob Deuel, K2GLO, (541) 482-8752, *k2glo@jkasystems.com*
Editor: Ludwell Sibley, KB2EVN, (541) 855-5207, *tubelore@jeffnet.org*
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TCA editor's note: This booklet originally appeared in 1978 as Antique Wireless Association Monograph (New Series) No. 1. It has been out of print long since. Yet it is an important work by Gerald Tyne, who - while better known for his Saga of the Vacuum Tube - had excellent research resources and personal contact with major individuals from "wireless" days. It is hoped that this reactivation will bring enjoyment and insight.

It appears that no further information has turned up on Wallace or his invention in the years since Tyne did his research.

The photos and advertisements in this text have been, where possible, taken directly from original issues of *Modern Electrics*, and digitally restored to some degree. Still, in many cases the image is a good copy of a poor original.

The original copy of this work was donated to TCA from the estate of the late Robert Lindsay.

Thanks are due to AWA for its cooperation in this reissuance.

Information on AWA is available on its Web site, **www.antiquewireless.org**. Its mailing address is P. O. Box 421, Bloomfield, NY 14469-0421.

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THE RJ4 DETECTOR AND THE WALLACE MYSTERY

Gerald F. J. Tyne
Research Associate, Smithsonian Institution
Author, Saga of the Vacuum Tube

The Bell Labs News *has said "Tyne probably knows more about the history of vacuum tubes than anyone else in the world." Jerry graduated from Rensselaer Polytech in 1921 and was on the faculty for six years. He joined Bell Labs in 1929. He personally made the inductors in the high-frequency circuits of Telstar as well as the attitude coils that encircle it. Jerry, now retired from Bell, received the Houck Award of AWA in 1973 for "outstanding documentation of the development of the vacuum tube." He conduct[ed] a tube symposium in the* Old Timers Bulletin *[now* AWA Journal*]. - [Bruce Kelley]*

When de Forest started making Audion Detectors for sale to amateurs in September 1909, they were simply advertised as "Audion Detectors" and bore no distinctive designation. They were first offered to the public as part of the "De Forest Standard Navy Type Radiotelephone," which was composed of an arc transmitter, a receiving tuner called a "Syntonizer" (which was a loose-coupled tuner using pancake coils), and two Audions, with a separate battery box. This assembly is shown in Figure 1. The pancake tuner was soon replaced by a conventional loose-coupler using telescoping cylindrical windings. The price quoted for the "Audion Detector" by the Radio Telephone Company in 1910 was $100.85 [1] and the unit was described in the price list as follows: "Audion Detector - of Ionized Gas Type - by far the most sensitive known. Mounted complete in oak box with batteries, rheostat, switches, wiring and two bulbs."

By the end of 1910 the Radio Telephone Company was in trouble with the law, and eventually was forced into bankruptcy. Its assets were sold by the Sheriff of New York County on March 7, 1911.

De Forest went to the West Coast and in July 1911 entered the employ of the Federal Telegraph Company. Here he worked with two assistants - Charles V. Logwood and Herbert van Etten. Logwood was an experienced wireless engineer and van Etten a former telephone engineer.

The Federal Telegraph Company was using the Poulsen arc as a continuous-wave transmitter, and the message to be sent was superimposed on the carrier by the use of a high-speed punched tape. The receiving equipment was unsatisfactory and de Forest undertook to redesign it. He soon obtained a Telegraphone from the American Telegraphone Company of Springfield, Massachusetts. This was a steel-wire recorder based on the original Poulsen recorder.

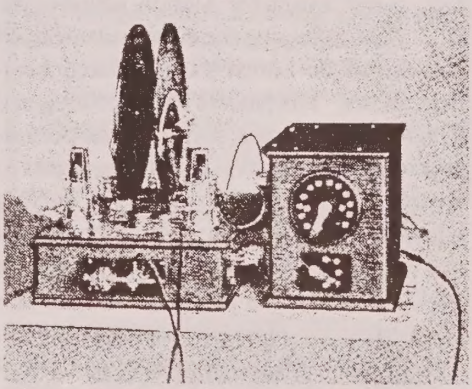


Fig. 1 - De Forest Syntonizer. Reproduced from Bulletin D-1 of the Radio Telephone Company, 1909.

By running the Telegraphone at high speed when recording, de Forest hoped to be able to re-run the wire at a much lower speed to enable an operator to translate the dots and dashes at normal receiving speed. When this was tried it was found that the output of the Telegraphone was too low to produce a usable response in the telephone receiver. To make the system work de Forest needed an audio-frequency amplifier.

He obtained some Audions from H. W. McCandless & Company in New York, and with the aid of van Etten put together a two-stage amplifier. The output was in-

sufficient for his needs, and, when he tried to increase it by using higher anode voltages on the Audions, the residual gas in the bulbs ionized and the signal became unintelligible. He then took the Audions to a glassworker named G. E. Lamont in San Francisco, who was in the business of making X-ray tubes [2]. Lamont repumped the Audions, heating the glass bulbs during the process, to drive out the occluded air. The re-exhausted bulbs could be operated at anode voltages up to 70 volts without ionization, and their power output was high enough to enable de Forest to build a workable audio amplifier. This was in the summer of 1912.

In October, de Forest went to New York to try to sell to the Telephone Company the right to use the Audion as a telephone repeater - without notifying the Federal Telegraph Company, with whom he had a contract. After testing the Audion, action of the A. T. & T. in buying the rights was delayed because of de Forest's complicated business affairs. His patents had been assigned to various companies, and de Forest personally was in no position to sell any rights to anyone. After months spent in untying legal knots to get a clear title to the right to use the Audion as a telephone repeater, the A. T. & T. Company paid de Forest his asking price of $50,000 in the summer of 1913.

With the money so obtained, de Forest set up a factory at 1391 Sedgwick Avenue, in the Highbridge section of the Bronx in New York City. Late in that year (1913) he started to produce and offer for sale for "private" (amateur) use only, an Audion detector designated the "RJ4 Detector." The prefix "RJ" meant "Radio Junior," and was used on all de Forest apparatus sold for, and restricted to, use by amateurs. The RJ4 was the first Audion detector to have a distinctive designation.

Figure 2 shows the first form of the RJ4. Note that it uses commercially made switches and a tubular, double-filament Audion. One of the switches was two-pole and was used for the selection of the filament to be used. This is at the right in the photograph. The filaments were turned off by turning the switch blade to a point between the contacts. The other was a three-point switch used to adjust the plate voltage.

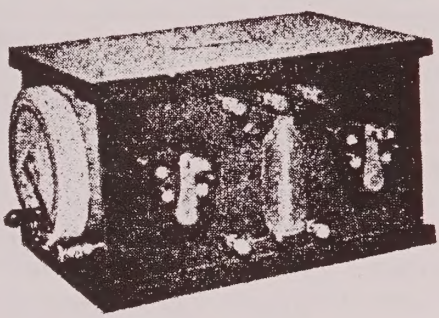


Fig. 2 - First form of RJ4 Detector. Reproduced from 1913 pamphlet of the Radio Telephone Company.

The RJ4 Detector was first announced in the November 1913 issue of *Modern Electrics* [3], Figure 3. The photograph used in this advertisement is exactly the same as that used in Wallace & Company's advertisement for the Wallace Valve Detector, Figure 4, which had been on the market since the summer of 1911. It was not advertised, however, until the October 1912 issue of *Electrician & Mechanic* [4], page *x*, Figure 5, which carried no illustration, and continued to be advertised until October 1913. It is almost impossible to distinguish the first version of the RJ4 from the Wallace Valve Detector, Figure 6.

Figure 7 shows the second version of the RJ4 [5]. The appliqued switches have been replaced by built-in switches, and the filament rheostat has been moved to the other end of the box. The tubular Audion is still used, but a different type of binding post has been provided for the tube leads. The two-point switch still selects the filament to be used and the filament is turned off by moving the switch blade so that it is between the two points.

The circuit diagram of the early RJ4 is also of interest, and is reproduced in Figure 8, from an instruction sheet supplied with all the RJ4 types. It shows a tube of the cylindrical type, and the outer ends of

The Audion Detector
THE RADIO TELEPHONE CO., holders of thirteen U. S. Letters Patent granted to Lee de Forest, covering detectors operated by heated gases and employing a local battery, present the Type R.J. 4 Audion Detector, at $15.00 (licensed for private or experimental use only).
BEAR IN MIND that this is the only detector of the audion type offered to the experimenter which is manufactured under our patents, and that we are the only concern from whom renewal bulbs may be legitimately obtained.
The manufacture, sale or use of any detector of the audion type not authorized by us constitutes an infringement on our basic patents, and we are prepared to take any and all measures necessary to protect our patent rights.
SEND 2C STAMP FOR BULLETIN DESCRIBING THIS INSTRUMENT.
The Radio Telephone Co.
Dept. J.
1391 Sedgwick Ave., New York
Live Dealers Write for Terms

Fig. 3 - First advertisement for RJ4 Detector. Reproduced from *Modern Electrics*, Nov. 1914, p. 867.

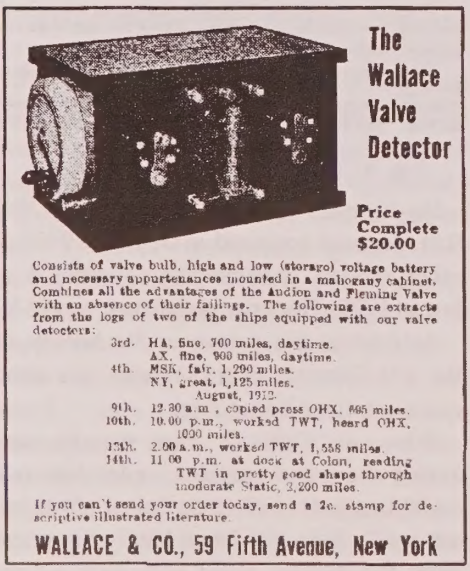
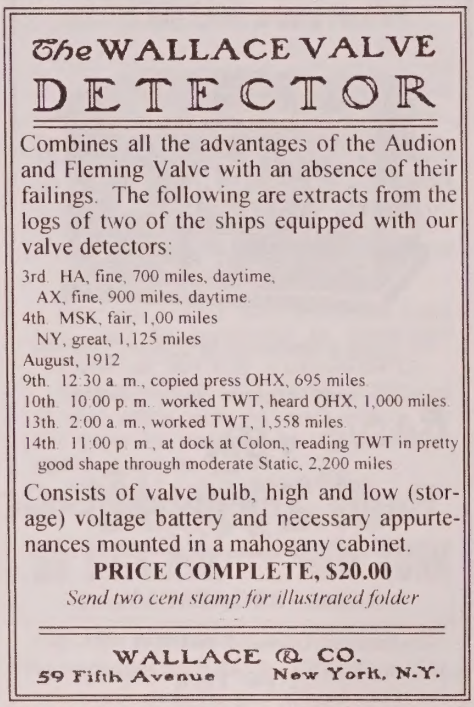

The Wallace Valve Detector
Price Complete $20.00
Consists of valve bulb, high and low (storage) voltage battery and necessary appurtenances mounted in a mahogany cabinet. Combines all the advantages of the Audion and Fleming Valve with an absence of their failings. The following are extracts from the logs of two of the ships equipped with our valve detectors:
3rd. HA, fine, 700 miles, daytime.
AX, fine, 900 miles, daytime.
4th. MSK, fair, 1,200 miles.
NY, great, 1,125 miles.
August, 1912.
9th. 12.30 a.m., copied press OHX, 695 miles.
10th. 10.00 p.m., worked TWT, heard OHX, 1000 miles.
13th. 2.00 a.m., worked TWT, 1,558 miles.
14th. 11.00 p.m. at dock at Colon, reading TWT in pretty good shape through moderate Static, 2,200 miles.
If you can't send your order today, send a 2c. stamp for descriptive illustrated literature.
WALLACE & CO., 59 Fifth Avenue, New York

Fig. 4 - Advertisement for Wallace Valve Detector. Reproduced from *Modern Electrics*, Nov. 1912, p. 843.

the two filaments are brought to a two-point switch, so that either filament can be used. This obviously applies only to the first and second types of the RJ4. However there is a note (obviously rubber-stamped on the original instruction sheet) which gives instructions on how to bring the second filament of a spherical Audion into use after the first filament burns out. Apparently de Forest kept down the cost of printed instruction sheets as much as possible.


The WALLACE VALVE
DETECTOR
Combines all the advantages of the Audion and Fleming Valve with an absence of their failings. The following are extracts from the logs of two of the ships equipped with our valve detectors:
3rd. HA, fine, 700 miles, daytime,
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August, 1912
9th. 12.30 a. m., copied press OHX, 695 miles.
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13th. 2.00 a. m., worked TWT, 1,558 miles.
14th. 11.00 p. m., at dock at Colon,, reading TWT in pretty good shape through moderate Static, 2,200 miles.
Consists of valve bulb, high and low (storage) voltage battery and necessary appurtenances mounted in a mahogany cabinet.
PRICE COMPLETE, $20.00
Send two cent stamp for illustrated folder
WALLACE & CO.
59 Fifth Avenue New York, N.Y.

Fig. 5 - First advertisement for Wallace Valve Detector. Reproduced from *Electrician & Mechanic*, Oct. 1912, p. x.

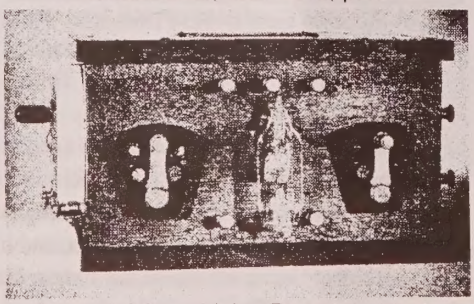

Fig. 6 - Wallace Valve Detector. Photograph courtesy of Lauren Peckham.

In 1914 de Forest introduced the "Improved Type RJ4 Detector," Figure 9. This was the first RJ4 to use a spherical Audion, and was first advertised in *Modern Electrics* and in *Electrician & Mechanic* in April 1914. This ad listed 19 authorized distributors of the RJ4 in the United States and the Rogers Electric Company in Can-

ada. Beginning with this model, all of the RJ4 Detectors had porcelain sockets and spherical Audions.

THE AUDION DETECTOR
TYPE R. J. 4.
The Audion is manufactured by the Radio Telephone Co. and protected by U. S. Pats. No. 979275, 879532, and eleven other De Forest Patents.
RADIO TEL. & TEL. CO.
The Radio Telephone Co.
309 BROADWAY NEW YORK
Department
309 BROADWAY
Factory: 1391 SEDGWICK AVE.
New York
Terms: Strictly net, cash with order

Fig. 7- Second form of RJ4 Detector. Photograph reproduced from early 1914 pamphlet of the Radio Telephone and Telegraph Company.

The American Reliable Company (not on the authorized list), advertised the RJ4 Detector in the *Electrical Experimenter* of August 1914 for $3.00 per week for six weeks, and in the September issue of the same magazine their price was $2.90 per week for six weeks.

The Radio Telephone and Telegraph Company advertised the RJ4 Detector again in October 1915 [7].

De Forest's RJ9, which in effect replaced the RJ4 and had a porcelain socket, was first offered for sale in February 1916 [8], and was made as late as October 1916. The RJ9 was a panel-type detector, the price of which did not include the B-battery. It required no box, could be made and sold at a lower price than the RJ4, and was an immediate success. The list of unfilled orders of the Highbridge plant, dated March 11, 1916, shows orders for 118 RJ9 Detectors at $14 each, and only 13 RJ4 Detectors at $18, and this was less than a month after the RJ9 was announced.

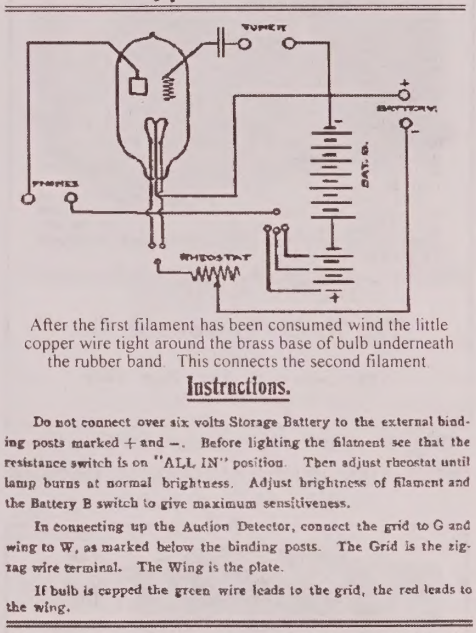
Circuit of Type RJ4 Audion Detector
PHONES
RHEOSTAT
After the first filament has been consumed wind the little copper wire tight around the brass base of bulb underneath the rubber band. This connects the second filament
Instructions.
Do not connect over six volts Storage Battery to the external binding posts marked + and −. Before lighting the filament see that the resistance switch is on "ALL IN" position. Then adjust rheostat until lamp burns at normal brightness. Adjust brightness of filament and the Battery B switch to give maximum sensitiveness.
In connecting up the Audion Detector, connect the grid to G and wing to W, as marked below the binding posts. The Grid is the zig-zag wire terminal. The Wing is the plate.
If bulb is capped the green wire leads to the grid, the red leads to the wing.
RADIO TELEPHONE & TELEGRAPH COMPANY
309 BROADWAY, NEW YORK

Fig. 8 - Circuit diagram of early RJ4s

De Forest's last advertisement for the RJ4 Detector appeared in October 1915 but other vendors continued to advertise it as late as 1925. The price at that time was $35.

As interest has grown in the history of the RJ4 Detector over the years, the same questions have been asked.

Who was Wallace? How was he marketing the same detector under his own name two years before de Forest's was advertised? Why did he suddenly disappear from the Audion scene with only a farewell ad in *Modern Electrics*, Figure 10?

To find the answers to these perennial questions and trace the activities of Wallace with only his ads in magazines sixty years ago as a point of reference, a search was made of the only available records pertinent to this era - records of those of similar interests who might have known him. The

word *available* must be stressed because this is being written in the winter of '77 and the author is snowbound in his own library.

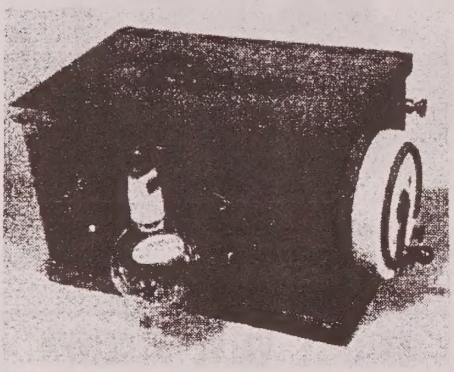

Fig. 9 - Improved Type RJ4 Detector

These records have the impact of a good "Western," and the search was a reminder that these were the Gold Rush days of radio, that the intrigues of these prospectors rivaled the staked claims with patent applications. The common bond was to "get rich quick," and the common denominator was distrust. Courts were jammed with lawyers charging piracy of ideas pertaining to a phenomenon they didn't understand; jurists bewildered by a new nebulous jargon decided who was "first." As many speculators and inventors were ruined as were made by the plight they themselves created.

Among the prospectors whose papers were available were Elwell, Logwood, Armstrong, Lowenstein, Kolster, and, of course, de Forest, who made the first strike. All of these men were contemporaries of Wallace.

An example of distrust: Lowenstein, formerly "Tesla's right hand man," became a consultant to one of de Forest's companies, but was never allowed in de Forest's laboratory: Kolster worked for de Forest and later became Lowenstein's assistant, but was never allowed in Lowenstein's laboratory. From disassociated references to Wallace found in the records of those hectic days an attempt has been made to present contemporaneous events in chronological order, and as this segment of history is put together the nomadic trail of Paul E. Wallace emerges. There is evidence that many were crushed in the power struggle. Was Wallace a prototype?

Pertaining to Wallace, only facts from sworn statements, excerpts from court records, and his own advertisements are offered here, without conjecture or romance. There are conflicting dates in some testimony and court records. These discrepancies are not consequential. For continuity, certain significant data are taken from a single source, a court petition filed in 1923.

ANNOUNCEMENT

On and after Sept. 15th, our WIRELESS TELEGRAPH SPECIALTIES will be sold at retail to the New York City trade by C. BRANDES, INC., Suite 2006, German American Bldg., No. 1 Liberty Street, where they will be exhibited and demonstrated. In this line are included our Improved Valve Detector at $13.50 and our Valve Receiver at $30.00, the one which has "put it over" the commercial apparatus.

Our mail order and wholesale business will be conducted as heretofore from our office at 59 Fifth Avenue.

No local retail trade will be supplied at this office, and no mail orders for our apparatus accepted by our local sales agent.

WALLACE & CO.

59 Fifth Ave. NEW YORK

Send 2c. stamp for new folder.

Fig. 10 - Wallace's last advertisement. Reproduced from *Modern Electrics*, Oct. 1913, p. 732.

Paul H. Wallace lived in Rochester, New York prior to 1911. He had been an avid amateur-radio enthusiast since 1905, and was using the Audion in the conventional manner. He made a trip to New York City in January 1910, visited the de Forest station in the Metropolitan Tower, and on this trip became acquainted with O. T. Louis of the "O. T. Louis Company" - specialists in scientific equipment - located at 59 Fifth Avenue, on the corner of 14th Street, in New York City. How long the visit to New York lasted and what transpired with whom is uncertain, but Wallace moved to New York in February 1911. He rented space from the O. T. Louis

Company, went into business as the "O. T. Louis Wireless Department," and paid a percentage of the profits as rent. He lived in the Hotel St. George, 49 E. 12th Street, New York City, Room 29.

From the time Wallace started the "O. T. Louis Wireless Department" it was evident that he was the right man for the job. He stocked Murdock and Clapp-Eastham parts and bought Audions from McCandless. He began to design his own equipment, first the "Wallace Valve Receiver" and then the "Wallace Valve Detector."

In a few months the business had grown beyond his expectations. In May 1911, Merritt D. Mosher went to work for Wallace and shared Room 29 at the St. George Hotel.

The first Audion equipment designed, made and sold by Wallace was a complete receiving set, Figure 11. This receiver had both crystal and valve detectors and was assembled by Wallace and Mosher. The first set "having the regular round Audion" was sold on a mail-order basis to someone in Atlanta or Augusta, Georgia in the summer of 1911. The second version of this set used a tubular Audion lying flat on the top of the box, and is shown in Figure 12.

The story of the Wallace Valve Receiver is included here because it was the circuit of this receiver, Figure 14, upon which Wallace based his claim of prior art in challenging the Armstrong patent on the regenerative circuit, U. S. Pat. #1,113,149.

In the summer of 1911 Wallace made and sold the "Wallace Valve Detector," Figure 6, at least a year before it was advertised. This was the first item of Wallace equipment sold to retail customers at 59 Fifth Avenue.

Wallace had an aerial set up at the Hotel St. George, and he and Mosher frequently brought to their room equipment which they made at the shop, to test it out or operate it for their own pleasure, and Room 29 became the scene of many of their wireless experiments.

Amateurs came to the store to buy parts, discuss problems, seek advice, listen-in on and operate the radio apparatus manufactured by Wallace and Mosher. In the

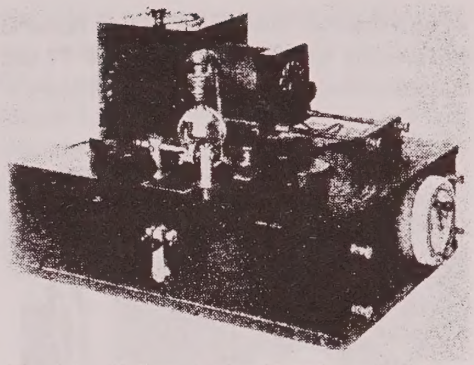

Fig. 11 - Wallace Valve Receiver, first form using spherical Audion.

WALLACE VALVE RECEIVER
Read these extracts from a letter written by an operator to the New York headquarters of his company.
"This is the niftiest thing I've ever gotten up against in wireless telegraphy. Simply immense. L—— comes in so loud that one would think he was but 20 miles distant instead of 195."
"It is also the most selective tuner I have ever worked with. I'm hoping that all the ships will have these receivers before the bad static comes on."
"All the ships with the — — — sets are fine business, but they can't come up to this one by a long shot."
"I certainly would like to see you PUSH these Wallace tuners so they would be on all the ships. It has everything else skinned to death."
Circular for 2c. stamp. (No postals).
WALLACE & CO.
59 Fifth Ave., New York.

Fig. 12 - Second form of Wallace Valve Receiver, using cylindrical Audion. Reproduced from *Modern Electrics*, June 1913, p. 286.

summer of 1911 the store had become the meeting-place of radio hams. It was here that Wallace became acquainted with W. F. Cotter, Charles Werner, E. H. Armstrong, and other enthusiasts, some of whom were invited to Room 29 to observe the sets and share the excitement and triumph of "distance." In turn, Wallace and Mosher visited these friends' workshops. E. H. Armstrong, a college sophomore, became one of this group.

Wallace was anxious to get into the

commercial market, as distinguished from the amateur trade, and decided to use his receiver as an entering wedge. Late in the summer of 1911, Wallace went to Mr. Austin F. Parkhurst, who was in charge of the installation of radio equipment on the fleet of the United Fruit Company. Wallace told him of the phenomenal performance of his receiver; of its efficiency as to distance, signal strength and ease of operation; how he had been able to read Mare Island, California; Sitka, Alaska; and a number of other Pacific-coast stations. Parkhurst gave him no encouragement, so Wallace went to the radio operator of the "Santa Marta," a United Fruit Company ship, and persuaded him to take Wallace's original receiving set and use it on one round trip to the tropics. Late in the fall of 1911 Parkhurst ran into difficulty getting receiving sets to meet his demands for the necessary ship radio service and took the responsibility for ordering one of Wallace's receivers to be installed on the "Almirante," the performance of the set to constitute a test demonstration. Wallace delivered the set and made a change requested by Parkhurst. "The slideable contacts employed to effect electrical circuit connection between the moveable secondary coil of the coupler and the terminals thereof was changed to a flexible wire connection." See Figure 11. Installation was made by R. H. Marriott and A. R. Rice, and inspected in Wallace's presence by Parkhurst. Parkhurst ordered another set to be installed on the "Carillo," and learned for the first time that another of his ships, the "Santa Marta," had also been equipped with a Wallace receiver, unofficially. While these ships made round trips to the tropics in the winter of 1911-1912, Wallace waited anxiously for reports from the operators.

Late In 1911, O. T. Louis, observing the expanding business, took a more active interest and began to advertise "the most complete line of high grade wireless apparatus in New York City" with the Catalogue #33 available for a 2-cent stamp (*Modern Electrics*, Dec. 1911, p. 638). The same month, his ad in *Electrician & Mechanic* offered Catalogue #32, "just out."

It is impossible to estimate how many Wallace Valve Detectors were sold in 1911. The Audions were bought for cash, and McCandless did not record the identity of cash purchasers in 1911.

Wallace & Company was formed on January 30, 1912, according to their certificate for doing business under that name, Wallace and Mosher becoming partners. O. T. Louis continued to advertise in *Modern Electrics* through March 1912. Wallace & Company's first ad in the same magazine appeared in the April 1912 issue, page 74, and their May 1912 ad in the same magazine (p. 77) carried the line "Formerly Wireless Department O. T. Louis & Company."

The business prospered early in 1912. They continued to sell the Wallace Valve Detector, and began to manufacture the Wallace Valve Receiver. The boxes and parts were bought from Clapp-Eastham and Murdock, and the Audions were supplied by McCandless. They built eight receivers and circulated descriptive bulletins.

In spite of the keen competition of other wireless apparatus vendors, Wallace was well established and highly regarded in the trade in 1912. For example, see the August 1912 issue of *Electrician & Mechanic*, Q. & A. section, p. 145, #1830 re Audion Detector, from "F. E. P." He was referred to Wallace & Company of 59 Fifth Avenue, New York City, even though up to this time Wallace had not advertised his Wallace Valve Detector, and this issue had to go to press at least one month before publication.

In late June or early July 1912, Mosher left the company. As the busy summer wore on, accounts of the success of the Wallace Receivers on the United Fruit Company ships began to filter in. Wallace & Company advertised the Wallace Valve Detector for the first time in the October 1912 issue of *Electrician & Mechanic* without any illustration. See Figure 5. The November issue of the same magazine, page

x, and November *Modern Electrics*, page 483, both carried ads with cuts of the Wallace Valve Detector. The price was $20.

The Wallace store had grown in popularity as a meeting place for radio amateurs, and many congregated there to hear the Taft-Wilson election returns sent by wireless telegraphy in November 1912. They listened to the returns on the Wallace Valve Receiver.

Wallace finally heard from Parkhurst, who told him that his receivers functioned satisfactorily, but the United Fruit Company was afraid of the patent situation, particularly patents owned by Marconi, and considered it inadvisable to acquire such apparatus from an independent manufacturer. The disappointment was particularly keen because the ship radio operators were so enthusiastic. The letter quoted in the Wallace ad for his receiver in the June 1913 *Modern Electrics*, page 286, was written by Thomas A. McClarney to Mr. Parkhurst in December 1912 or January 1913. McClarney was a radio operator stationed at Colon, Panama, who worked a schedule with the United Fruit Company's ships coming into Colon.

Wallace returned to his thriving amateur trade. O. T. Louis Company moved away from 59 Fifth Avenue and Wallace & Company took over the place. Records show that Wallace bought 108 Audions from McCandless in 1912 to manufacture his detectors and receivers. The popularity of his Valve Detector grew and with it came competition. J. F. Arnold of 243 East 118th Street, New York City, advertised a "Bulb" type detector in April 1913, *Modern Electrics*, page 82, Figure 13. The controls were mounted on top of the box, with a spherical Audion mounted in a gooseneck socket, price $15. Arnold's May ad in the same magazine states that the Arnold Bulb Detector is also for sale by J. H. Bunnell Company of New York City. Competition was reflected in Wallace's reduced prices.

The second version of the Wallace Receiver was brought out, Figure 14, and this had the tubular Audion, as did all Wallace Detectors. During the first 10 months of 1913, Wallace bought 172 Audions to manufacture his equipment.

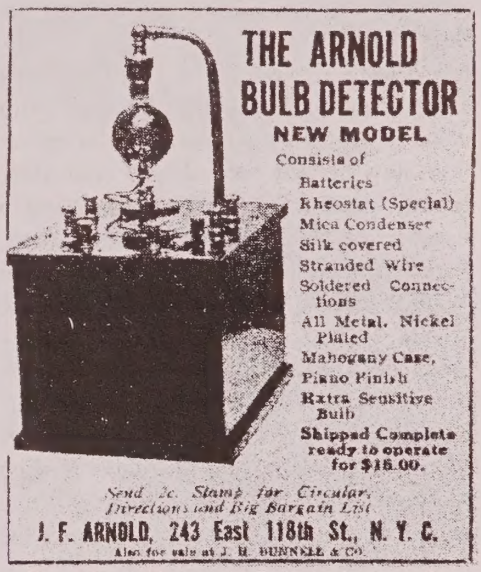

Fig. 13 - J. F. Arnold Bulb Detector. Reproduced from *Modern Electrics*, June 1913, page 290.

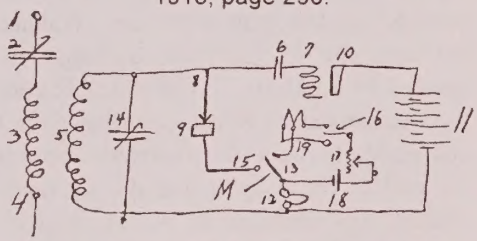

Fig. 14 - Circuit of Wallace Valve Receiver

During the time that Wallace was building his empire, 1911-1913, de Forest was in deep trouble financially and with the law. De Forest, his attorney Capt. S. E. Darby, James Dunlop Smith, Elmer E. Burlingame, and others had been indicted for using the mails to defraud. He left Federal Telegraph Company in April 1913, and returned to New York in May. He worked at the development of the Audion as an amplifier at the old Biograph studio on 14th street, not too far from Fifth Avenue. He was drawing a small salary from two backers interested in his new venture. In the course of a few months the salary became less and then ceased. Even with the cloud of facing trial hanging over

him during the summer, de Forest made plans to get back into business. When he received $50,000 from the Telephone Company late in July, he immediately set about forming a new "instant company." In the weeks that followed he leased the building at 1391 Sedgwick Avenue in the Bronx, and ordered machinery to go into production of radio receivers, amplifiers, and set components. He ordered materials and 500 Audions from McCandless; hired an assistant ,C. V. Logwood; set up his experimental laboratory; and opened an office downtown for the convenience of ship owners and amateurs. These were pressure-packed days for de Forest, with his determination to have a going business before the trial started. He needed an "instant product" for his "instant company."

The Wallace & Company ad in the October 1913 *Modern Electrics*, page 732, Figure 10, was a shocker to New York amateurs. It announced that on and after September 15th the Wallace Wireless Telegraph specialties would be sold to the New York City retail trade by C. Brandes, Inc., where they would be exhibited and demonstrated, including the improved Valve Detector at $13.50 and the Wallace Valve Receiver at $30. Mail-order and wholesale business only would be conducted as usual at 59 Fifth Avenue. There were no illustrations. This was Wallace & Company's last advertisement.

De Forest placed his first advertisement from the Highbridge plant, the Radio Telephone Company, in the November issue of *Modern Electrics*, Figure 3. He introduced the De Forest RJ4 Detector. It was a duplicate of the Wallace Valve Detector, and the ad carried the illustration used by Wallace in his ads. The text in the ad for De Forest's RJ4 was a threat to sue infringers. There had been no time to make changes in the illustration or in the detector, only the name.

De Forest went on trial that month, the jury being impaneled and sworn in on November 24th, and while the trial was going on de Forest and a lawyer, Mr. Banzoff, reorganized the Radio Telephone Company, forming a new corporation - the Radio Telephone and Telegraph Company. (See second ad, Figure 7). The trial continued through January 1, 1914. De Forest and Capt. Darby were acquitted, the other three found guilty.

While the trial was going on, Wallace went out of business. What about his receiver and E. H. Armstrong?

On July 15, 1914 Wallace was outward bound as a radio operator on the U. S. Fisheries ship "Roosevelt" and remained in this position till June 1916, when he became a radio officer in naval service on the U. S. S. Kanawha. He was on furlough in February 1917. Records do not indicate where he was during WW I, but the trail is picked up in Juneau, Alaska in the summer of 1919; Detroit in December 1919; back to New York early in 1920, when he went to work for the International Radio Telegraph Company at Bush Terminal in Brooklyn, and stayed there until November 1920.

During this latter period and for some time before, Wallace maintained a residence in Palisades Park, New York. His home was completely destroyed by fire on April 23, 1920 and he lost all of his business records, drawings, sketches, old advertising copy, instruction leaflets, radio equipment which he had manufactured, and all data pertaining to Wallace & Company - everything except the original radio receiver which had been installed on the "Santa Marta" in 1911. He had loaned this, in October 1919, to the son of a friend who lived in Hudson, New York. After the fire, Wallace moved to an apartment on West 123rd Street in New York City.

Some time in April - it is uncertain whether it was before or after the fire - Wallace looked up an old friend, Winfred Royce, who had worked for him in 1913. Royce told Wallace that Armstrong had been trying to get in touch with him and gave him Armstrong's telephone number. Wallace called Armstrong, who invited him to meet

him at the office of his attorneys, Messrs. Pennie, Davis, Marvin, and Edmonds.

Wallace did so and was asked to recall an incident which had occurred in February 1913 when Wallace had visited Armstrong at his home in Yonkers. The incident was the operation of a certain radio receiving set, the circuit of which was not disclosed to Wallace or others present. Wallace said he recalled the incident, and also remembered certain varying characteristics which he described as the heterodyne effect.

He was asked to so testify for Armstrong in the suit which Armstrong and Westinghouse E. & M. Company had filed against the De Forest Radio Telephone and Telegraph Company for infringement of Armstrong's patent on the regenerative circuit, U. S. Patent #1,113,149. Armstrong claimed to have invented the circuit in October 1912.

On May 19, 1920, Wallace entered the office of Armstrong's attorneys to be sworn in and give his testimony. Wallace claimed that the last thing Armstrong said to him before entering was not to mention anything about the circuits Wallace had devised and used in his receiver, which Armstrong had operated in Wallace's store and in Room 29 back in 1911-1912. Armstrong cautioned him to confine himself strictly to what he was asked about, both in direct and cross-examination. Wallace said he complied with Armstrong's instructions but resented the restrictions of the line of questioning. He was asked if he had been present in Armstrong's home on a certain night in February 1913, if he had heard distant stations on Armstrong's radio, was the quality good, and who else was present.

Shortly after this Wallace visited his friend's son in Hudson, New York and took back his original Wallace Valve Receiver.

Wallace's testimony was used in the Armstrong litigation, and during the summer Judge Mayer ruled in favor of Armstrong. By this time Wallace realized that what he had in his original set was a regenerative circuit, Figure 14. In November 1920 he went to work for Westinghouse doing maintenance and repair of machinery and radio apparatus at their New York shop on 10th Avenue. He remained in this job until March of 1922, when he left New York, taking his radio receiver with him. He stayed a few months in Charleston, West Virginia, and then settled in Cape May, New Jersey, hoping to find employment with a radio manufacturer.

Following is a quote from Wallace's sworn statement.

> "In the summer of 1922 I decided to put the information concerning my work and in *(sic)* my 1911 apparatus and the foregoing facts in the hands of the United State Government for such use as the Government might care to put them to. As a result, in November 1922 I received a letter from a representative of the Department of Justice requesting me to call to see him."

The letter Wallace received from the Special Assistant to the Attorney General was addressed to him, c/o Mr. Merritt D. Mosher, who was living in Rochester, New York.

Wallace met with two Special Assistants to the Attorney General of the United States Department of Justice: Mr. Octavius Knight of Knight Bros., 2 Rector Street, New York City and Mr. Janke (initials too faded to decipher). He told them the story of his having been in business; developing the Wallace Valve Receiver; of having allowed Armstrong to operate it in 1911-1912, both at his store and in Room 29; of the receivers having been installed on three United Fruit Company ships for trial runs to the tropics in 1911-1912 in commercial use; that his circuit was the same as the circuit in Figure 4 of the Armstrong regenerative circuit patent #1,113,148, Figure 15; and therefore he claimed prior art. Wallace brought with him his original receiving set. Mr. Knight and Mr. Janke traced out the circuit shown in Figure 14. Wallace left the set with them and returned to New Jersey.

In May 1923 Wallace received a telegram from Mr. Knight requesting a meet-

ing at the Robert Treat Hotel in Newark, New Jersey. The meeting took place and Mr. Knight brought with him Samuel E. Darby, Jr. (son of Capt. Darby), attorney for the De Forest Radio Telephone and Telegraph Company, who was appealing the case filed against them by E. H. Armstrong and the Westinghouse E. & M. Company.

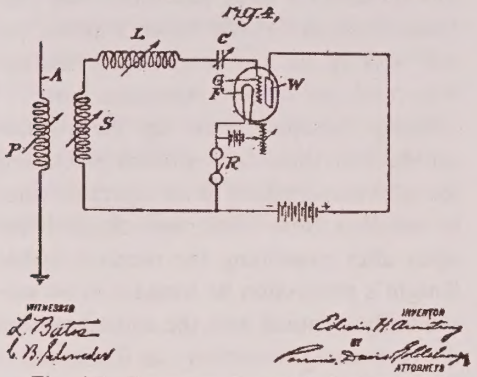

Fig. 15. Regenerative circuit shown as Figure 4 of Armstrong patent, U. S. Pat. No. 1,113,149

The following information is taken from the petition filed in the U. S. Court of Appeals, Second District, in defense of the De Forest Company on June 8, 1923, setting forth new evidence showing that the Armstrong patent covered the invention made by another, was incorporated in radio receiving instruments, was publicly known and used in commercial operations of the United Fruit Company, by and with the knowledge of, among others, the following:

Paul E. Wallace of Cape May, N.J.
Merritt D. Mosher of Rochester, N.Y.
Austin F. Parkhurst of Chicago, Ill.
R. H. Marriott of Seattle, Wash.
A. R. Rice of Mare Island, Calif.
William Francis Cotter of Buffalo, N.Y.
Carl Jones of Crystal River, Fla.

The nature of the new evidence and the manner of its discovery were set forth as follows.

Octavius Knight, acting in the capacity of Special Assistant to the Attorney General of the United States in the Department of Justice in patent matters, called on Samuel E. Darby on April 18, 1923 and gave him a copy of an affidavit executed February 26, 1923 by Wallace, pointing out that Wallace had been a witness for Armstrong and had testified as an amateur operator in the trial of the suit in the District Court; that the witness did not testily as to any knowledge of the Armstrong invention but his testimony was confined to facts as to certain phenomena which occurred when a certain radio receiving apparatus was operated without knowledge of circuit arrangement. The affidavit of Wallace set forth that the circuit of the Armstrong invention had been devised by himself and actually included in a radio set constructed by him in the summer of 1911, more that two years prior to the filing date of the Armstrong patent in suit, and more than a year prior to the date testified to by Armstrong as his date of conception on the invention. In the affidavit was an account of Wallace's dealings with the United Fruit Company. Mr. Knight stated that he had the original set which was installed on the first United Fruit steamer in the winter of 1911, in his possession, in its original condition, entirely operative, and it was located in the safe in his office.

Darby asked Knight to arrange a meeting with Wallace, the meeting which took place at the Robert Treat Hotel. As a result, Darby employed Wallace to locate the various men named by him as having personal knowledge of, and who had personally operated the receiving sets in question, and arrange to accompany him to interview each of them. The following statements, condensed, are taken from the affidavit of the petition submitted to the courts.

As a result, Mr. Knight, Mr. Darby, and Mr. Wallace met in Rochester on May 22, 1923 and interviewed Mosher, the former partner in Wallace & Company. He confirmed all that Wallace had said and was able to state positively that these things happened prior to June 1912, because he left the company at that time. He had operated the set himself many times, the results being far in excess as to distance and

sensitiveness over any set available at that time. He accurately described the set and the circuit employed.

From Rochester, Mr. Knight, Mr. Darby, and Mr. Wallace proceeded to Chicago and interviewed Mr. Austin F. Parkhurst, who was then an Assistant Radio Inspector for the Ninth District. He confirmed Wallace's report of the installation of his receiver on three of the United Fruit Company's ships, and had very definite recollection that the set on the "Almirante" was installed by R. H. Marriott, presently of Seattle, Washington, and A. R. Rice, presently Inspector of Radio at Mare Island, California, and was inspected by himself; that during the installation he learned for the first time that the set had been in unofficial use on the "Santa Marta." He said that he was totally satisfied with the performance of the Wallace apparatus. He accurately described the receiving set from memory, and readily identified the same from a series of photographs, and gave them the name of the operator on the "Almirante" (Carl Jones) and who was presently in Florida, near Pensacola.

Mr. Knight, Mr. Darby, and Mr. Wallace went to Buffalo and interviewed Mr. William F. Cotter, a consulting and practical radio engineer, who was with Lawrence F. Horle. He confirmed Wallace's story, and said that he was an amateur in 1911-1912 and knew Wallace and Mosher, and was a frequent visitor at their store and at their Room 29 at the St. George Hotel. He recalled definitely operating the set on the night of the Taft-Wilson election in November 1912. Cotter said that he had confined his activities to radio since 1912, was engaged in commercial work with the U. S. Navy, and with Western Electric Company in radio research since that time. He readily identified the apparatus from photos shown him as that which he had operated on the election night in 1912, even recalling certain peculiarities in the construction with which he had been impressed.

All of these men offered to give evidence under oath as to the statements made by them supporting Wallace's claims.

Knight, Darby and Wallace returned to New York and Darby instructed Wallace to take the first train to Florida and locate the operator, Carl Jones. Wallace was in Florida about a week and found that Carl Jones lived in Crystal River, Florida, but was serving on a ship operating between New York and a South American port.

Darby therefore drew up the petition setting forth these facts without precluding the later presentation of the operator when he reached New York, and claimed that upon after examining the receiver in Mr. Knight's possession he found it to be substantially identical with the embodiment of the Armstrong invention - as illustrated in Figure 4 of the Armstrong patent in suit and as particularly set forth and claimed in the claims 1, 2, 3, 4, 5, 8, 9, 12, 14, 15, 16, 17, and 18 of the said Armstrong patent.

The petition requested the Court's permission to file with the District Court for the Southern District of New York, a petition for leave to file a Bill of Review for the purpose of having the said decree reviewed, reversed, and set aside. The petition was filed June 8, 1923.

It was denied by the Court, without opinion, June 18, 1923.

Armstrong claimed his date of invention as October 1912.

De Forest's claim was based on the date August 1912, and he eventually won.

What happened to the claims staked by Paul Wallace, with his date of summer 1911, confirmed by men well recognized in the field of radio?

These fragmentary records of half a century ago turn the spotlight of history on the profile of an early prospector who may have been trampled in the gold rush. Other records may surface to complete a full picture of Paul E. Wallace and give answers to the tantalizing questions which inevitably goad the researcher and haunt the historian.

REFERENCES

1. DeForest Price List #26835A, dated June 1910.
2. Transcript of Record in U. S. Circuit of Appeals for the Third District, Nos. 3799, 3800, 3801. General Electric Company vs. De Forest Radio Company, Vol. 2. Testimony of G. E. Lamont, pp. 1025-1067.
3. Advertisement of the Radio Telephone Company in *Modern Electrics*, Nov. 1913, p. 867.
4. Advertisement of Wallace & Company in *Electrician & Mechanic*, Oct. 1912, p *x*.
5. Advertisement of the Radio Telephone Company in *Modern Electricity & Mechanics*, Jan. 1914, p. 104. The apparatus was advertised by the Radio Telephone and Telegraph Company in *Modern Electricity & Mechanics*, Feb. 1914, p. 242.
6. Advertisement by the Radio Telephone and Telegraph Company in *Modern Electrics & Mechanics*, April 1914, p. 521.
7. Advertisement in *Popular Science Monthly and The World's Advance*, Oct. 1915, p. 128 of advertising section.
8. Advertisement in *Electrical Experimenter*, Feb. 1916, p. 532.
9. Advertisement in *Electrical Experimenter*, Oct. 1916, p. 386.